

Claim 11 was rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Tsuji et al. ("Tsuji"). Applicants respectfully traverse.

Enclosed is a complete copy of Tsuji with some portions highlighted for the Examiner's convenience and reference in view of the following comments. A copy of what is believed to be Tsuji's corresponding English language patent, GB 2 224 328 A is attached.

This reference is referred to at page 1, last paragraph to page 2, line 11. It is not possible to clean a pipe, which is normally not straight but contains curved portions, with Tsuji's apparatus. None of the corners of the cross section can touch the interior surface of a pipe. The destination of Tsuji is the contrary of cleaning, namely cladding the interior of the pipe by a coating.

In Tsuji, the coiled spring cannot touch the pipe wall because of the cladding members 6a, 6b and 6c (Figs. 1 and 2), guiding members 61 (Figs. 6 and 8 to 15) as well as cladding members "6, 9, 10 and 12-15). As for cleaning, the tools are attached to the front end of wire 3 (the coiled spring). See col. 6, lines 26-29.

In view of the foregoing, the rejection must be removed.

Claims 11 and 13 were rejected as allegedly anticipated by MacLeod. This rejection is respectfully traversed.

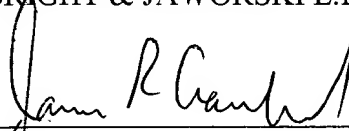
MacLeod is silent as to cleaning pipes with the coil shown in Fig. 5. He desires to close such a helix to a ring by a coupling as shown in Figs. 1 and 2, and it would be impossible to use such a closed ring for pipe cleaning. Even mentioning saws, files or rasps or the like in Col. 1, lines 57-58, and Col. 3, lines 25 to 27 does not overcome the restriction to closed rings. Figs. 15 and 16 show such an application. Insertion into a lengthy pipe is impossible. In view of the foregoing, withdrawal of this rejection is respectfully requested.

If any fees are due for entry of this amendment or to otherwise maintain pendency of this application, authorization is given to charge deposit account no. 50-0624.

Respectfully submitted,

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Enclosures

CLAIMS IN MARKED-UP FORM

11. (Amended) Apparatus for the cleaning of interior pipe walls [by means of] comprising: a coil spring forming a spring shaft with windings of spring steel and with a rotation axis and a coiled winding axis, the windings having at least on their exterior a cross section different from [the] a circular shape, [characterized in that] wherein at least the exterior of the windings is profiled such that the spring shaft itself acts with at least one edge scrapingly on contamination of the pipe walls.

13. (Amended) Apparatus according to claim 11, wherein the cross section of the windings is a square whose one [surface] cross section diagonal runs at least substantially radially to the rotation axis.

Spring Shaft for Pipe Cleaning Apparatus

BASIC ROUND AND SUMMARY OF THE INVENTION

The invention relates to a spring shaft for cleaning pipelines [pursuant to the preamble of claim 1]

Such spring shafts, which are also called cleaning coils, consist usually of a coiled drawn steel wire of round cross section with a smooth surface. They are provided at their ends with couplings for connecting to a great variety of tools, such as drills, cutterheads, thrashing chain heads, pipe brushes, root cutters, mud drills, etc. The machines that drive them and their manner of operation are explained in the detailed description.

The known spring shafts are substantially of only a drive character. The mounted tools are inserted into clogged pipelines by the spring shaft, which can also be composed of several spring shafts, and "work their way" through elbows, branch lines etc. They are withdrawn by reversing their sense of rotation, and in the case of stubborn blockage they can also perform periodical forward and reverse movements.

DE 38 32 716 C2 discloses a spring shaft with a cross section in the shape of a rectangle or trapezoid, from which two opposite edges run parallel to the axis of the spring shaft. The outer edge of these helically running edges lies in an imaginary cylindrical surface if one considers the outstretched position of the spring shaft. Thus the corners of this cross section which also run helically can exercise no cleaning action on the inner walls of pipes, even when the spring shaft is passed through bends or elbows because in these cases the outer edge of the cross section contacts the bend only tangentially on its smallest radius of curvature; in other words the cross sectional edges in the pipe bend cannot come in

The shaping can be done by rolling, grinding or milling, also on the wire before winding, if desired. In this case heed must be paid only to precise guidance in the winding.

Embodiments of the invention are described below in conjunction with Figures 1 to 4, wherein:] 5.

- 5 Figure 1 is a side view of a section of the length of a spring shaft of a first embodiment,
 Figure 2 the section II from Figure 1 on a larger scale,
 Figure 3 a section through a half turn of the spring shaft of Figure 1, also on a scale larger

than in Figure 1, and

FIGURES 4 and 5

Figure 4 various additional embodiments on a section of the length of a spring shaft on a

scale larger than in Figure 1, and

FIGURE 5 is a view of a
 DETAILED DESCRIPTION SPRING SHAFT according to the prior art

In Figures 1 to 3 there is shown a spring shaft 1 for a pipe cleaning apparatus not

shown, which consists in a known manner of a portable or mobile driving machine having
 an electric motor and a clutch driven thereby. This clutch contains sector-shaped clutch
 jaws which can be urged radially against the spring shaft, the pressure applied determining
 15 the torque of the spring shaft.

The spring shaft 1 consists of a coil spring 2 of spring steel, with an axis of rotation RA
 and a plurality of windings 3 whose exterior 4 is provided with a profile 5 in which
 projections 6 and grooves 7 and 8 alternate. The projections 6 are sharp-edged at least in the
 direction of the circumference of the winding axis (WA-WA). In this case the projections 6
 20 are surrounded by the grooves 7 and 8. The profile 5 extends, of course, over the entire
 length of the spring shaft 1.



Claims

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IT IS CLAIMED:

1. Apparatus for the cleaning of interior pipe walls by means of a coil spring (2) forming a spring shaft (1) with windings (3, 3a, 3b, 3c) of spring steel and with a rotation axis (RA) and a coiled winding axis (WA-WA), the windings (3, 3a, 3b, 3c) having at least on their exterior (4) a cross section different from the circular shape, characterized in that at least the exterior (4) of the windings is profiled such that the spring shaft (1) itself acts with at least one edge (K) scrapingly on contamination of the pipe walls.
2. Apparatus according to claim 1, characterized in that the exterior (4) is provided with at least one longitudinal groove (8) following the windings (3, 3c).
3. Apparatus according to claim 1, characterized in that the cross section of the windings (3b) is a square whose one surface diagonal (4b) runs at least substantially radially to the rotation axis (RA).
4. Apparatus according to claim 1, characterized in that the exterior (4) is provided with a profile (5) in which projections (6) and grooves (7, 8) alternate.
5. Apparatus according to claim 4, characterized in that the projections (6) are sharp-edged at least in a circumferential direction of the winding axis (WA-WA).